FLEET

D-9R missile system with R-29R ballistic missile

May 26, 2016 13

In 1974, the USSR Navy adopted the R-29 submarine-launched ballistic missile, which became the basis of the new D-9 complex. The R-29 became the first domestic intercontinental missile for submarines and made it possible to significantly increase the strike potential of the naval component of the strategic nuclear forces. However, the fleet's weapons needed to be constantly improved. By the end of the seventies, the D-9R complex with the R-29R missile was adopted. As part of this project, it was again possible to solve a number of important design problems, which led to an additional increase in the potential of strategic submarine cruisers.

It should be noted that preliminary development of the project, which later became known as the D-9R / R-29R, started back in the late sixties. Specialists of SKB-385, headed by V.P. The Makeevs were instructed to work on a preliminary design for the modernization of the D-9 complex in order to improve its basic characteristics. It was necessary to study the possibility of changing the dimensions of the rocket, using new power plants and using several types of warheads. The promising R-29M missile (as the project was initially called) was supposed to carry one, three or eight warheads with nuclear warheads.

The preliminary design of the D-9M/R-29M was completed in 1970, but its prospects remained uncertain for some time. In addition, doubts arose about the need to continue the work. In the middle of 1971, the development of the D-19 complex with the R-31 solid-fuel rocket with the required characteristics began. However, the development of a solid-fuel rocket faced serious

difficulties, which is why the D-9M project was given the green light in July 1972. Over the next few months, SKB-385 was supposed to present a new project.

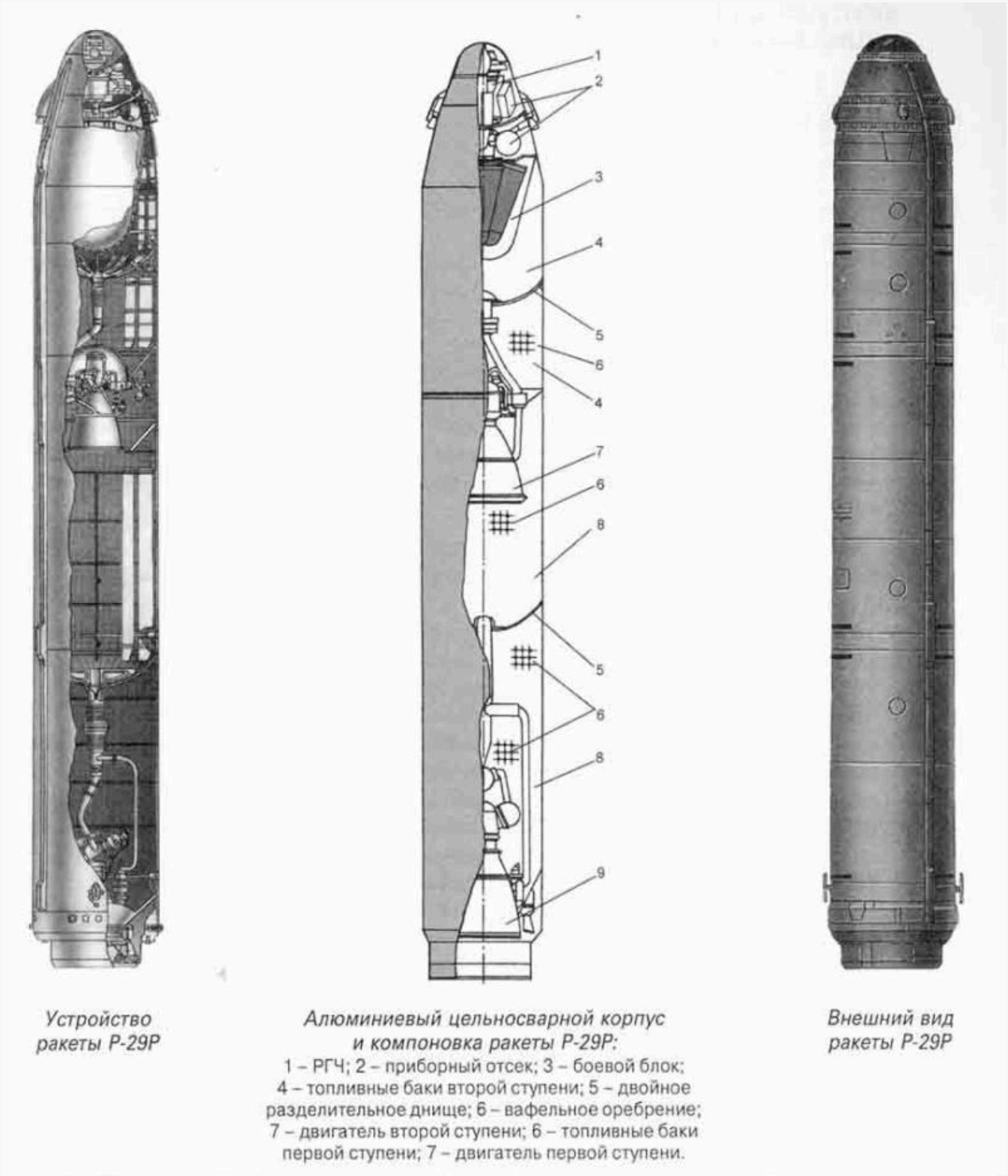
R-29R missile on a transport trolley. Photo Russianarms.ru

At this stage, the submarine weapon system received an updated designation with the letter “P” instead of the previously used “M”. The objective of the D-9R / R-29R project was to create a ballistic missile capable of carrying a multiple warhead with several warheads, although the use of a monoblock one was not excluded. The technical specifications implied equipping the missile with one, three or seven warheads. At the same time, the introduction of a number of new technical solutions was canceled due to their complexity. The R-29R product was supposed to be a modernization option for the developed R-29 with the minimum required amount of modifications.

By the end of 1972, the design bureau completed preliminary design and submitted documentation to industry management. The specialists' proposal satisfied the customer, which resulted in an order to begin the full development of the new complex. The corresponding resolution of the USSR Council of Ministers was issued on February 13, 1973.

The new project proposed to make maximum use of the developments from previous developments. It was planned to unify the R-29 and R-29R missiles across various units, as well as to use existing control systems for carrier

submarines with minimal changes. This approach made it possible to reduce the time required for design, and also made it possible to speed up testing and subsequent adoption. In particular, it was decided to abandon tests with a submersible stand, and also to reduce the test program at the land test site. Also, due to its complexity, the development of a warhead with seven warheads was temporarily abandoned - it was planned to be created later.



Устройство ракеты Р-29Р

Алюминиевый цельносварной корпус и компоновка ракеты Р-29Р:
1 – РГЧ; 2 – приборный отсек; 3 – боевой блок; 4 – топливные баки второй ступени; 5 – двойное разделительное днище; 6 – вафельное оребрение; 7 – двигатель второй ступени; 6 – топливные баки первой ступени; 7 – двигатель первой ступени.

Внешний вид ракеты Р-29Р

Diagram of the R-29R rocket. Drawing Russianarms.ru

The new ballistic missile, in order to save time and money, was supposed to be

a modernized version of the existing one. As a result of this approach, the general architecture of the product, the layout of the units, the design of most of its elements, etc. were preserved. Thus, it was proposed to build the R-29R rocket according to a two-stage design with a guidance stage and equip it with liquid engines. The main unit of the rocket was an all-welded body made of aluminum-magnesium wafer shells. It was proposed to separate the stages using an elongated charge, tearing the body in the desired plane.

Most of the hull volumes, as before, were allocated for the placement of two-stage tanks. The lower bottoms of the fuel tanks for both stages had a special concave shape, thanks to which engines could be placed in them. Curved upper bottoms were also provided, designed to accommodate certain units. The fuel tank was separated from the oxidizer tank using a double common bottom. This design made it possible to eliminate compartments between the tanks and steps.

The first stage of the R-29R rocket received a 3D40 type liquid engine that used asymmetrical dimethylhydrazine and nitrogen tetroxide. This engine had one large main chamber and two small steering chambers mounted on gimbals. The second stage received a 3D41 single-chamber liquid engine. Its single camera, mounted on an oscillating gimbal, was supposed to be responsible for both generating thrust and maneuvering.

Loading an experimental rocket into a launcher at a land test site. Photo Rbase.new-factoria.ru

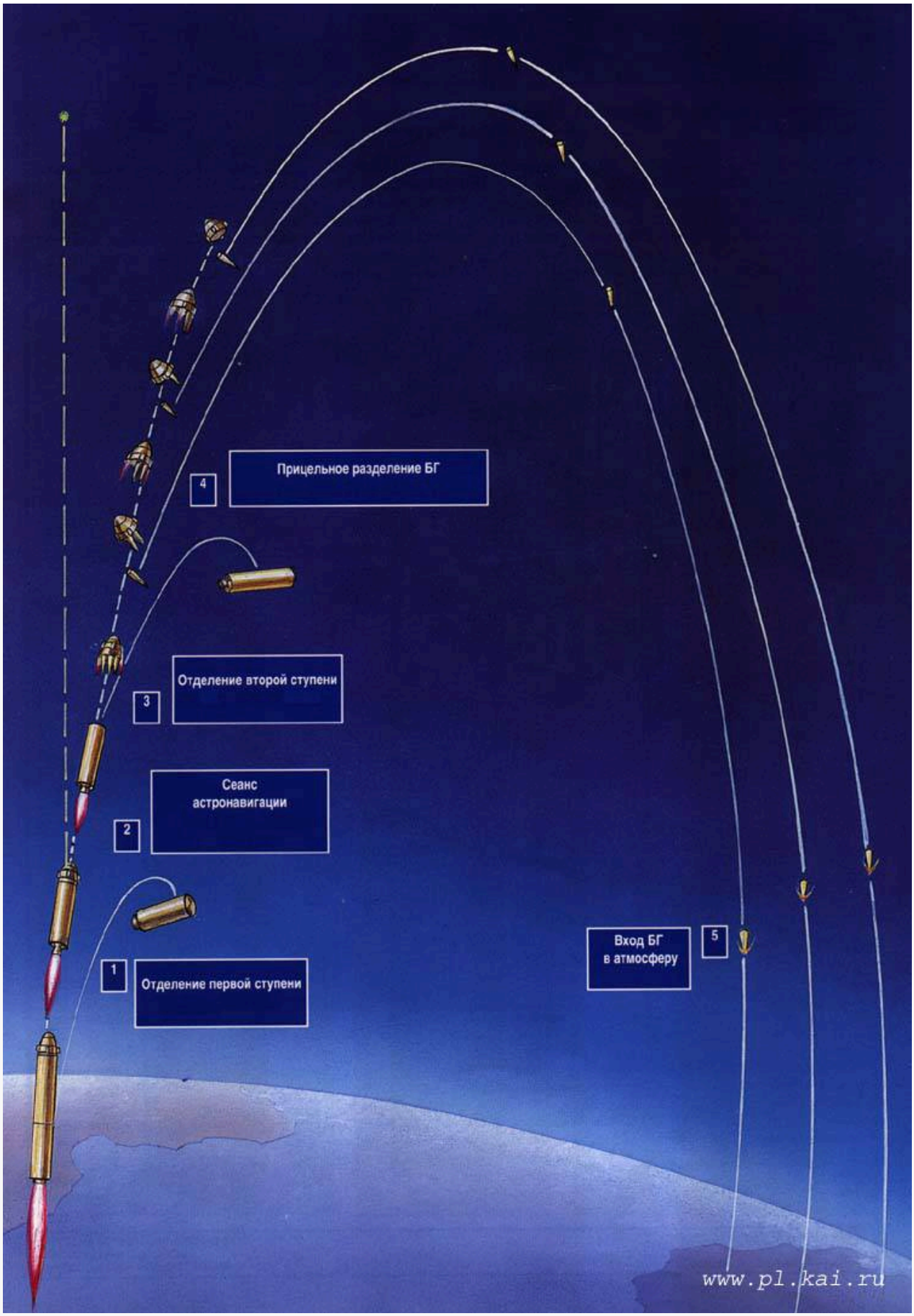
It was proposed to attach a combat stage with control systems and a payload in the form of warheads to the top of the second stage. The combat stage received its own liquid engine for maneuvering. In addition, it was equipped with an instrument compartment to accommodate all the necessary equipment. The instrument compartment was divided into two parts using a sealed bottom. In the head part of the compartment, equipped with a transparent fairing, there was a gyro-stabilized platform with an astrological device. Another control system was mounted in the rear compartment. For a denser arrangement of units, the control system elements did not receive their own shock absorbers. Instead, the frame with the equipment as a whole was suspended on shock absorbers.

The design of the combat stage was designed taking into account the use of various combat loads. This product could be used to carry any configuration of

warheads required by the technical specifications. The combat stage could accommodate from one to seven warheads of different sizes with different characteristics. Maintenance and replacement of the combat stage was ensured without removing the entire missile from the launcher.

As in the R-29 project, it was proposed to use a combined guidance system based on inertial equipment and astrocorrection. During the passage of the active section and in the disengagement section, the position of the missile had to be monitored by an inertial navigation system. After the separation of the first stage, an astrocorrection session was to be performed to clarify the location of the rocket and adjust the trajectory. After this, control again passed to inertial instruments.

Several combat units were to be located on the combat stage mounts, the number of which was determined by the customer of the product. The first version of the project envisaged the use of a monoblock warhead with a capacity of 450 kt. Instead of one warhead, three of 200 kt each could be used. Subsequently, a 100-kt small-sized warhead was created. The rocket could carry seven such products. In addition to warheads, the missile could be equipped with decoys to break through enemy missile defenses.



Flight diagram of the R-29R missile with three warheads. Figure Rbase.new-factoria.ru

Regardless of the configuration of the warhead, the R-29R missile had to maintain its overall dimensions and weight. The length of the product was 14.1

m, the diameter of the body was 1.8 m. The launch weight was determined to be 35.3 tons. Warheads with different numbers of warheads differed in weight, which affected the main characteristics of the missile, primarily range. Thus, when using a monoblock warhead, it was possible to attack targets at ranges of up to 8000 km. The use of a multiple warhead reduced the maximum range to 6500 km. Regardless of the range, the CEP was 900 m.

During the D-9R / R-29R project, it was decided to retain most of the units for the carrier submarine. In addition, the basic principles of interaction between the launcher and the missile were preserved. The product was proposed to be supplied to the fleet in a refilled ampoule form, which would reduce the necessary preparation of the rocket before loading onto the carrier and before launch. After loading into the launcher, the rocket had to be held in place using several belts with shock-absorbing devices. The control equipment for the missile system has undergone some changes, primarily related to the need to calculate a flight mission to hit several targets.

The principles of launching a new rocket remain the same. It was possible to launch from the carrier's surface position or from under water, from a depth of up to several tens of meters. Due to the operation of the main engine at low thrust, the rocket had to exit the silo, rise above the water and then increase thrust, starting the active phase of the flight. When using a monoblock warhead, the flight of the R-29R missile was in no way different from the R-29. In the case of three or seven warheads, a disengagement section was added to the flight path. After disconnecting the second stage, the combat stage had to maneuver and sequentially launch warheads onto the required trajectories. The characteristics of the combat stage made it possible to hit several targets within a relatively large area.

Project 667BDR submarine "Kalmar". Photo Bastion-karpenko.ru

The widespread use of existing and used components and assemblies made it possible to reduce testing of the new rocket, eliminating testing on a submersible stand. In November 1976, the first P-29Rs were delivered to the Nenoksa test site for testing on ground launchers. In almost two years, until October 1978, 18 launches were carried out at the test site. At the same time, one of the missiles was fired at a range close to the maximum. Other launches were carried out at a reduced range. 11 missiles with monoblock warheads and 8 with multiple warheads were used up.

In 1972, TsKB-18 received the task of creating a project for modernizing the 667BD Murena-M nuclear submarine, which involved the use of the new D-9R missile system. The new project received the designation “667BDR” and the code “Squid”. The new nuclear submarine was to receive 16 silo launchers for R-29R missiles and a set of corresponding control systems. The development of the project was completed by the beginning of 1974. On May 7, 1974, the laying of the lead boat of the K-441 project took place. It was also decided to abandon the completion of the K-424 nuclear submarine according to the original project 667BD. The submarine, laid down in January 1974, now had to be completed according to the Kalmar project. On December 30, 1976, both of these submarines were delivered to the fleet. In addition, the K-449 cruiser, laid down in November 1975, began service with them.

Shortly before being accepted into the Navy, in November 1976, the K-441 submarine joined the testing of a new missile system. Test launches of R-29R missiles from a submarine were carried out until the fall of 1978. During this time, 22 missile launches were carried out in different configurations with various flight missions. According to reports, four missiles with monobloc warheads were used, six with three warheads each, and the rest used missiles with seven warheads. Launches were made at minimum, intermediate and maximum ranges. In addition, volley shooting was carried out.

Loading the R-29R missile into the silo of the K-496 Borisoglebsk submarine (decommissioned in 2009). Photo Warfare.be

The successful completion of test launches opened the way for the new D-9R complex with the R-29R missile to be used by the fleet. Even before the end of flight tests, on August 25, 1977, the new system was adopted as a weapon for Project 667BDR Kalmar submarines. In connection with the completion of work on the missile system project, the construction of carrier submarines continued. Until 1981, the USSR Navy received 14 nuclear submarines of a new design, each of which could carry 16 R-29R missiles.

According to some reports, the development of a missile with seven warheads was delayed, which is why it was put into service only in July 1979. It is also mentioned that this version of the missile received its own designation R-29RL, and the complex as a whole was called D-9RL.

The appearance of Kalmar-class submarines and R-29R missiles made it possible to significantly increase the strike potential of the fleet's submarine forces. Since 1981, after the last boat of the new project was commissioned, the fleet has been able to keep up to 224 R-29R missiles with an intercontinental flight range deployed. Depending on the combat equipment, the submarine's missiles could carry from 224 to 1,568 warheads (from 16 to 112 on each nuclear submarine) and attack a corresponding number of enemy targets. Thus, Project 667BDR nuclear submarines and R-29R missiles have become the most important means of ensuring nuclear parity with a potential enemy.

Launchers of nuclear submarine K-433 pr. 667BDR. Photo: Wikimedia Commons

In 1980, it was decided to continue the development of the D-9R / R-29R complex with an increase in its main characteristics. The first upgrade option was the D-9RK complex with the R-29RK missile. The new project proposed equipping the R-29R missile with warheads borrowed from the D-19 / R-39

complex. This made it possible, with similar weight parameters, to increase the power of the charges to 250 kt each. Due to some lightening of the missile, it was possible to increase the firing range by 5%, increase accuracy by 40%, and also increase the diameter of the warhead deployment zone by 43%. In 1981, a new complex was tested with the firing of 12 R-29RK missiles. In September 1982, the D-9RK complex was put into service.

The next modernization, carried out in 1984-85, also increased the combat qualities of the rocket. It was proposed to equip the new R-29RKU product with small-sized warheads with a capacity of 100 kt, developed for the new R-29RM missile. Control systems and ship equipment have also undergone changes. After eight test launches in 1987, the D-9RKU / R-29RKU complex was put into service.

In March 1990, the R-29RKU-01 missile with 20 kt warheads, also borrowed from the R-29RM product, was put into service. There is information about the creation of a modification of the R-29RKU-02 with the next update of combat equipment. This missile was put into service in 2006.

In the mid-nineties, the State Missile Center named after. V.P. Makeeva developed the Volna launch vehicle based on the R-29R product. Such a rocket retained two stages of the existing design, but received a new third stage. The latter was equipped with a solid fuel engine and was intended to drive the load onto the required trajectory. The maximum payload of the “Volna” was determined to be 115 kg. In 1995-2005, five launches of such launch vehicles with different loads on board took place, three of which ended in successful completion of the assigned tasks.

In the START-1 treaty, the R-29R missile was designated as the RSN-50. Photo Russianarms.ru

In 1979, the largest modernization of the D-9R / R-29R complex began, which resulted in the creation of the R-29RM missile. Upgrading the missile led to a significant increase in performance and also required the development of a new carrier submarine. As part of the new project, it was possible to achieve a significant increase in performance, thanks to which, in particular, the missiles of the R-29RM family still remain in service and remain the most important element of the Russian strategic nuclear forces.

Due to the problems of the nineties, as well as moral and physical obsolescence, most of the Project 667BDR Kalmar nuclear submarines have now been decommissioned and scrapped. At the moment, only three boats of this type remain in service: K-433 “St. George the Victorious”, K-223 “Podolsk” and K-44 “Ryazan”. All three strategic missile submarines serve in the Pacific Fleet. At the beginning of the last decade, the K-129 Orenburg submarine underwent modernization under Project 09786, as a result of which it became the carrier of a special underwater vehicle, and also received a new side number BS-136.

Over time, the Kalmar submarines were replaced by newer Project 667BDRM

Dolphin nuclear submarines armed with R-29RM missiles. However, a number of such ships still remain in the fleet and are in service, ensuring the security of the country. The appearance of the D-9R/R-29R missile system made it possible to quickly achieve the required parity with a potential enemy in terms of the number of deployed warheads. After almost four decades since they were put into service, these systems are still in use by the fleet and accomplish their assigned tasks, despite their moral and physical obsolescence. It can be assumed that the Kalmars with missiles of the R-29R family will remain in service for the next few years, being used in parallel with submarines and new types of missile systems.

Based on materials from:
http://rbase.new-factoria.ru/
http://makeyev.ru/
http://russianarms.ru/
http://deepstorm.ru/
http://bastion-karpenko.ru/
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Apalkov Yu.V. Submarines of the Soviet fleet 1945-1991. Volume II: – M: “Morkniga”, 2011
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13comments

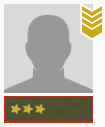
INFORMATION

Dear reader, to leave comments on a publication, you must **be logged in** .

cosmos111
26 May 2016 06:01

-12

According to the site, there are only retro themes, not any information on new weapons.



Old26
26 May 2016 08:21

+1

Kirill! There are 2 typos in the text.
There is a typo in the third paragraph:

> *In the middle of 1971, the development of the D-19 complex with the **R-31** solid-fuel rocket with the required characteristics began*

The D-19 complex had a missile R-39

In the fifth paragraph from the bottom

> ***In March 1990, the R-29RKU-01 missile with 20 kt** warheads , also borrowed from the R-29RM product, was put into service.*

You've lost your zero, don't you think?

> **Quote: cosmos111**
>
> *According to the site, there are only retro themes, not any information on new weapons.*

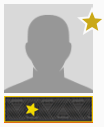
It's good that there are retro themes. For some comrades, it's not superfluous to learn **"MATERNAL PART"** . Otherwise, sometimes you can read on a military resource blunders like **the R-36 "Voevoda"** or **R-29 "Sineva"**

DenZ
May 26, 2016 09:07

+3

> **Quote: Old26**
>
> *Otherwise, sometimes you can read on a military resource blunders like the R-36 "Voevoda" or R-29 "Sineva"*

But “Sineva” is not R-29???? Let it be known to you R29RMU2 "Sineva" is a deep modification of the Makeevskaya R-29. So this is not such a serious mistake (although it is certainly inaccurate). The missiles have only one base. There are much more stupid errors on the site.



Andrey NM +5
26 May 2016 10:24

A photograph of a boat with open shaft covers is an RPK SN 667bdrm K-114 "Tula". Only on this boat the fairings of the last 4 shaft covers have a tricky square shape. Out of ignorance, someone posted this photo on Wikipedia and called it BDR, and people copy-paste it.

Operator -1
26 May 2016 14:12

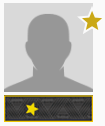
Old 26:
Abbreviated indices without prefixes M2 and RMU2 were used deliberately to indicate domestic breakthrough technology (combining the bottom of fuel and oxidizer tanks, ampulization, recessed engines, gas-dynamic pressurization, thermostatting), which was involved in all modifications of these missiles without exception.
The context of my comment has escaped your awareness

Old26 +2
May 26, 2016 10:29

> **Quote: DenZ**
>
> *But “Sineva” is not R-29???? Let it be known to you R29RMU2 "Sineva" is a deep modification of the Makeevskaya R-29. So this is not such a serious mistake (although it is certainly inaccurate). The missiles have only one base. There are much more stupid errors on the site.*

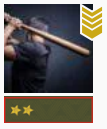
As for more serious mistakes, I agree. But no one canceled the

accuracy in statements.
About deep modification. Structurally, the R-29 differs from the R-29R. In relation to it, one could say that “Sineva” is a deep modification of the R-29R. But we can say that “Voevoda” is a very deep modification of the V-2.
In principle, the modification has the same base index, since the base missile is modified. All three - R-29, R-29R and R-29RM have different indices. Inside, yes, I agree that the same R-29RKU-02 is a deep modification of the R-29R (or RK).
But “Sineva” is still an R-29RMU, not an R-29R. The same R-29 index does not mean that this is the same missile and that the R-29 can be called “Blue”. Just like the R-36 and Voevoda, they are representatives of two different families of missiles. R-36 is 8K67 (a representative of the SS-9 family), "Voevoda" is 15A18M, a representative of the SS-18 family



Andrey NM +4
May 26, 2016 12:52

Dear Old26, the R-29R is indeed a deep modernization of the R-29. This can be seen in the layout of the engines, the diameter of the product and a number of other features. R-29RM - only similar in appearance. Yes, the basic principle of the layout, the same wafer in the shell... The engines are different, the number of steering blocks is different, the diameter is different, the tables are different. At the same time, all the “jambs” of previous machines were taken into account. It's like La-5 and "donkey". The engines seem to be airborne, and they look blunt-nosed, but they are different. Figuratively, of course. I hope you understand.
And all the modernizations of the R-29R, RL, RKU, etc. In fact, they affect the “top” of the rocket, and this is the instrument, heads, various “bells and whistles” such as decoys, etc.



Zaurbek 0
May 26, 2016 11:22

I don’t understand, when a missile fires from a land-based silo, you can calculate the trajectory and aim, but the boat patrols a large area of the ocean and can fire from different places. How is aiming going?

INTA_VEGA +1

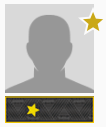
26 May 2016 15:18

For guidance from absolutely anywhere in the world, a celestial navigation algorithm has been specially introduced. This is also stated in the article: “After the separation of the first stage, an astrocorrection session was to be carried out to clarify the location of the rocket and adjust the trajectory.”

ism_ek 0

26 May 2016 15:21

The boat determines its position using inertial systems (correction by stars and GLONASS) and transmits the coordinates to the rocket. In space, the rocket is guided by the stars. In any case, this is a weapon of retaliation. Submarines are shooting at cities. One submarine is enough to cause “unacceptable” damage to the United States.



Andrey NM +1

26 May 2016 17:08

Ilya, how often does the boat float up or float up for adjustments (in fact, that’s not what it’s called)? Does GLONASS always work underwater? And by what stars are they determined? And on a polar day, what are the stars? And if GLONASS does not work, what should I do? In fact, everything is several orders of magnitude more complicated. You just talk about it so confidently... By the way, there are several types of astrocorrection. A lyrical digression - when I first got to the BDR, I was struck by the abundance of rats; this did not happen on other boats. I don't remember which building. The first mate from this BDR later became the commander of the K-140.

Mister22408 0

November 1, 2016 11:18

INS is our everything and the Mayak radio station :-). In terms of layout, the numbers are not always correct.

Andrey NM +2
26 May 2016 19:02

In Krasnoyarsk, city residents can see this rocket at any time of the day or night. She stands right behind the KRASMASH fence near the entrance.

"Right Sector" (banned in Russia), "Ukrainian Insurgent Army" (UPA) (banned in Russia), ISIS (banned in Russia), "Jabhat Fatah al-Sham" formerly "Jabhat al-Nusra" (banned in Russia) , Taliban (banned in Russia), Al-Qaeda (banned in Russia), Anti-Corruption Foundation (banned in Russia), Navalny Headquarters (banned in Russia), Facebook (banned in Russia), Instagram (banned in Russia), Meta (banned in Russia), Misanthropic Division (banned in Russia), Azov (banned in Russia), Muslim Brotherhood (banned in Russia), Aum Shinrikyo (banned in Russia), AUE (banned in Russia), UNA-UNSO (banned in Russia), Mejlis of the Crimean Tatar people (banned in Russia), Legion “Freedom of Russia” (armed formation, recognized as terrorist in the Russian Federation and banned), Kirill Budanov (included to the Rosfinmonitoring list of terrorists and extremists)

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